BOARD OF STUDIES
NEW SOUTH WALES

2011

HIGHER SCHOOL CERTIFICATE EXAMINATION

General Mathematics

General Instructions

- Reading time – 5 minutes
- Working time – $2\frac{1}{2}$ hours
- Write using black or blue pen
  Black pen is preferred
- Calculators may be used
- A formulae sheet is provided at the back of this paper
- Write your Centre Number and Student Number on the Question 27 Writing Booklet

Total marks – 100

Section I Pages 2–11

22 marks

- Attempt Questions 1–22
- Allow about 30 minutes for this section

Section II Pages 12–24

78 marks

- Attempt Questions 23–28
- Allow about 2 hours for this section

Section I

22 marks
Attempt Questions 1–22
Allow about 30 minutes for this section

Use the multiple-choice answer sheet for Questions 1–22.

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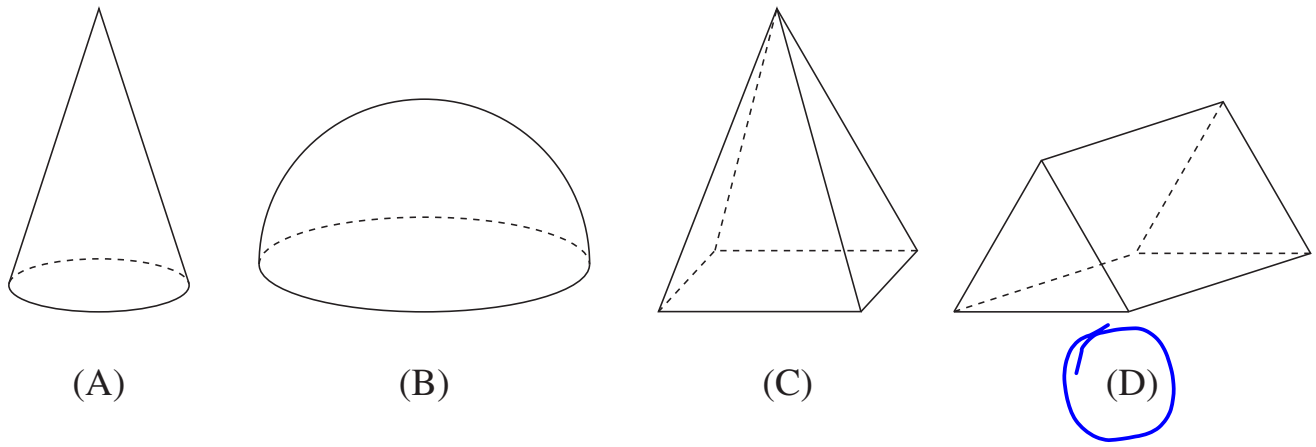
1 Which of the solids shown is a prism?



(A) (B) (C) (D)

2 Which of the following could be the probability of an event occurring?

(A) 1

(B) $\frac{6}{5}$

(C) 1.27

(D) 145%

3 Perth in Western Australia is 8 hours ahead of Greenwich in England. Cape Town in South Africa is 2 hours ahead of Greenwich.

What is the time in Cape Town when it is 1 pm in Perth?

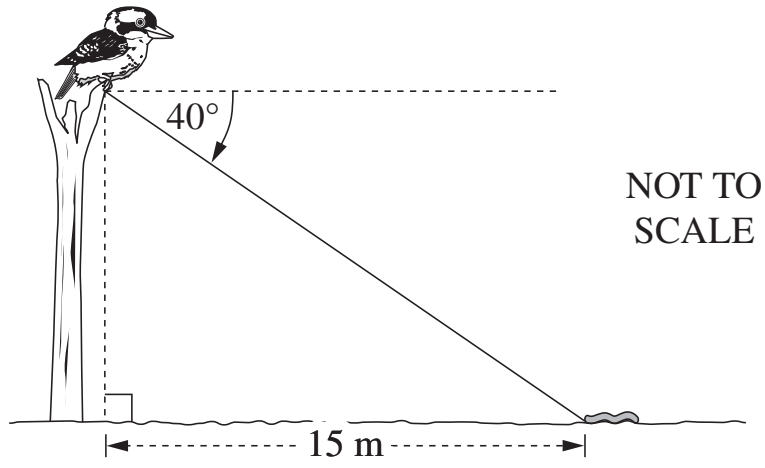
(A) 3 am

(B) 7 am

(C) 7 pm

(D) 11 pm

4 The angle of depression from a kookaburra's feet to a worm on the ground is 40°. The worm is 15 metres from a point on the ground directly below the kookaburra's feet.



How high above the ground are the kookaburra's feet, correct to the nearest metre?

(A) 10 m

(B) 11 m

(C) 13 m

(D) 18 m

5 The letters A, B and C are used to make a three-letter company name. Each letter is used only once.

How many different company names can be made?

(A) 3

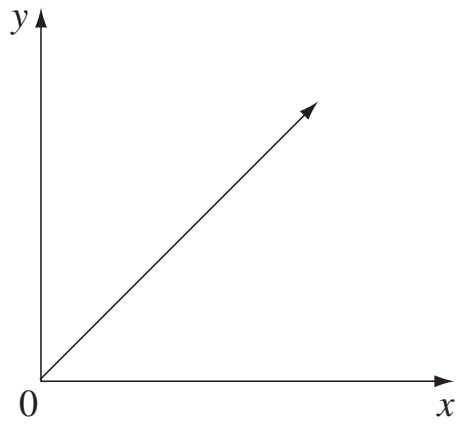
(B) 6

(C) 9

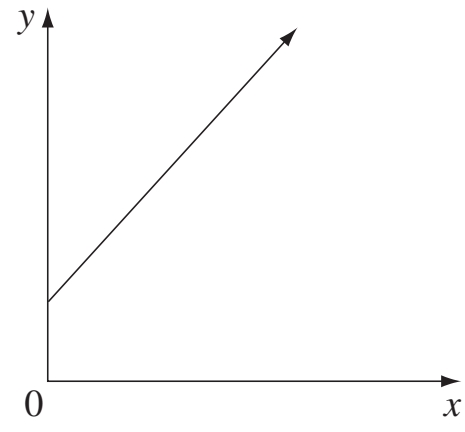
(D) 27

6 Which of the following graphs best represents the equation $y = a^x$, where a is a positive number greater than 1?

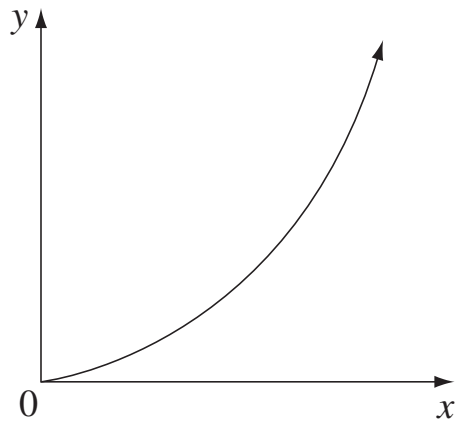
(A)



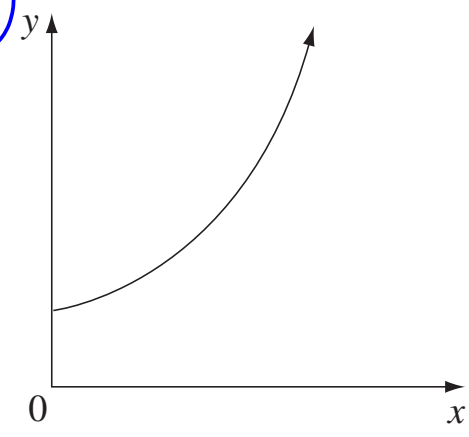
(B)



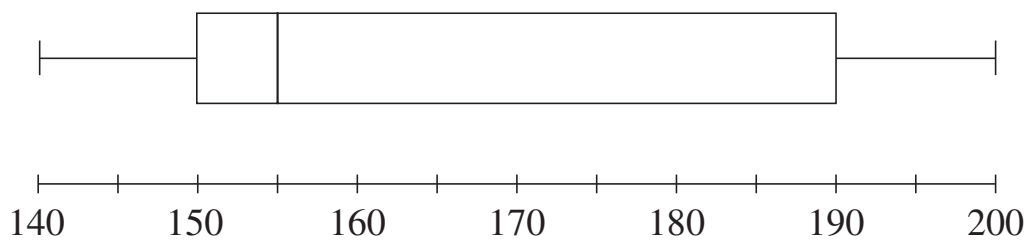
(C)



(D)



7 A set of data is displayed in this box-and-whisker plot.



Which of the following best describes this set of data?

(A) Symmetrical

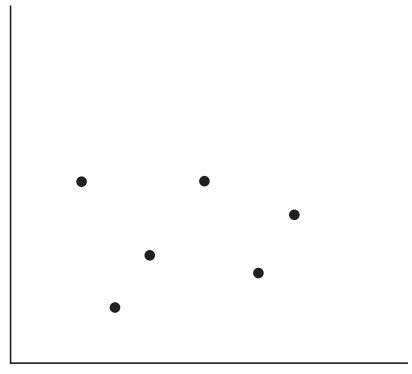
(B) Positively skewed

(C) Negatively skewed

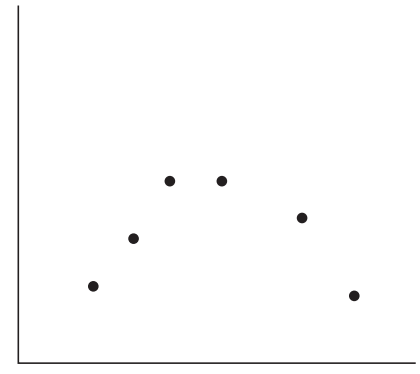
(D) Normally distributed

8 In which graph would the data have a correlation coefficient closest to –0.9?

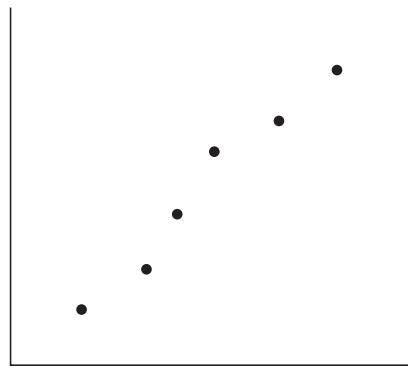
(A)



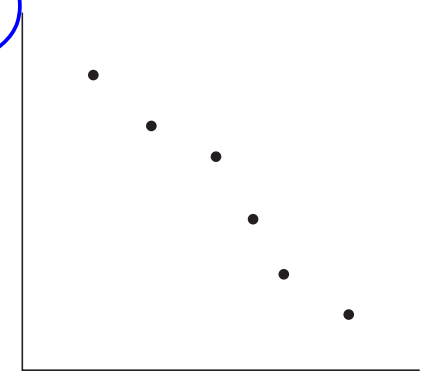
(B)



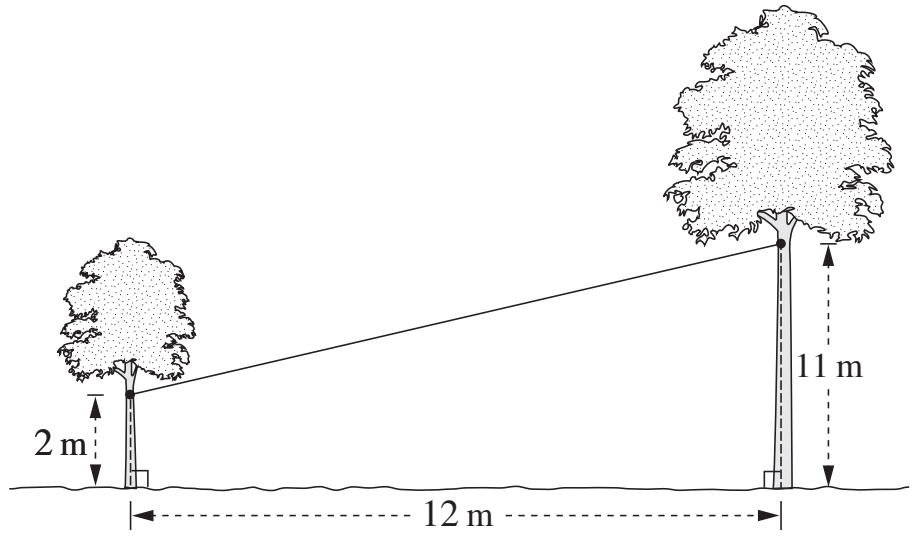
(C)



(D)



9 Two trees on level ground, 12 metres apart, are joined by a cable. It is attached 2 metres above the ground to one tree and 11 metres above the ground to the other.



NOT TO SCALE

What is the length of the cable between the two trees, correct to the nearest metre?

(A) 9 m

(B) 12 m

(C) 15 m

(D) 16 m

10 A television was purchased for $2100 on 12 April 2011 using a credit card. Simple interest was charged at a rate of 19.74% per annum for purchases on this credit card. There were no other purchases on this credit card account.

There was no interest-free period. The period for which interest was charged included the date of purchase and the date of payment.

What amount was paid when the account was paid in full on 20 May 2011?

(A) $2143.16

(B) $2143.59

(C) $2144.29

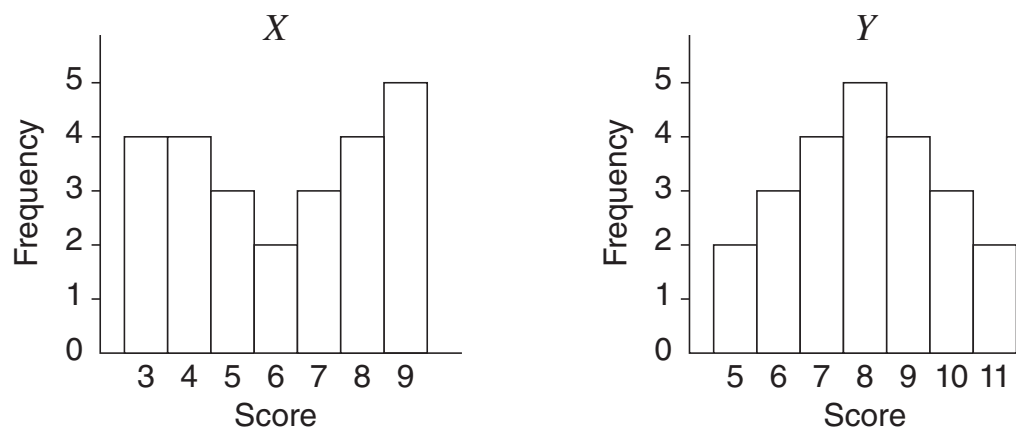
(D) $2144.74

Days diff = 30 − 12 + 20 = 38 + 1 (incl)
= 39

$I = 2100 \times 0.1974 \times \frac{39}{365}$
$= \$44.29$

$A = \$2144.29$

11 The sets of data, *X* and *Y*, are displayed in the histograms.



Which of these statements is true?

(A) *X* has a larger mode and *Y* has a larger range.

(B) *X* has a larger mode and the ranges are the same.

(C) The modes are the same and *Y* has a larger range.

(D) The modes are the same and the ranges are the same.

12 Which of the following expresses $\frac{6x^2y}{3} \div \frac{2y}{5}$ in its simplest form?

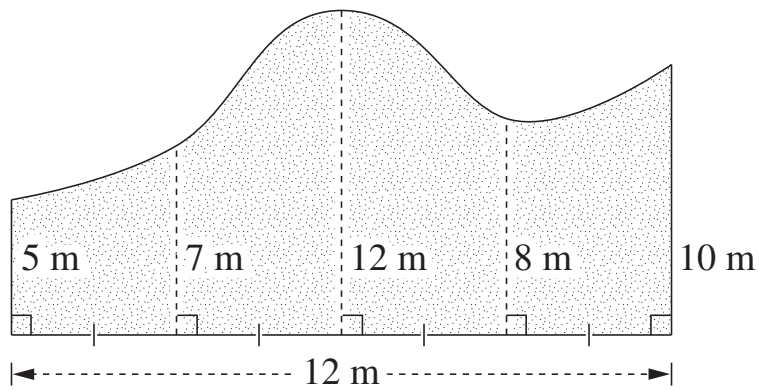
(A) $5x^2$

(B) $30x^2y$

(C) $\frac{1}{5x^2}$

(D) $\frac{5}{4x^2y^2}$

13 The diagram represents a field.



NOT TO SCALE

What is the area of the field, using two applications of Simpson's rule?

(A) 99 m^2

(B) 126 m^2

(C) 198 m^2

(D) 396 m^2

$A \approx \frac{3}{3}[5+4\times7+12]+1[12+4\times8+10]$

$= 99$

14 A data set of nine scores has a median of 7.

The scores 6, 6, 12 and 17 are added to this data set.

What is the median of the data set now?

(A) 6

(B) 7

(C) 8

(D) 9

Since 2 new scores <7 & 2 new >7

15 An unbiased coin is tossed 10 times.

A tail is obtained on each of the first 9 tosses.

What is the probability that a tail is obtained on the 10th toss?

(A) $\frac{1}{2^{10}}$

(B) $\frac{1}{2}$

(C) $\frac{1}{10}$

(D) $\frac{9}{10}$

16 A loan of $25 000 is used to purchase a car. The term of the loan is three years and the interest rate is 9% per annum, compounded fortnightly.

Which equation should be used to calculate the fortnightly repayments, M?

(A) $25\,000 = M\left\{\dfrac{(1+0.09)^3 - 1}{0.09(1+0.09)^3}\right\}$

(B) $25\,000 = M\left\{\dfrac{(1+0.09)^{78} - 1}{0.09(1+0.09)^{78}}\right\}$

(C) $25\,000 = M\left\{\dfrac{\left(1+\dfrac{0.09}{26}\right)^3 - 1}{\dfrac{0.09}{26}\left(1+\dfrac{0.09}{26}\right)^3}\right\}$

(D) $25\,000 = M\left\{\dfrac{\left(1+\dfrac{0.09}{26}\right)^{78} - 1}{\dfrac{0.09}{26}\left(1+\dfrac{0.09}{26}\right)^{78}}\right\}$

Use Present value form for loan

$N = 25000$

$r = \dfrac{0.09}{26}$

$n = 3 \times 26 = 78$

17 The heights of the players in a basketball team were recorded as 1.8 m, 1.83 m, 1.84 m, 1.86 m and 1.92 m. When a sixth player joined the team, the average height of the players increased by 1 centimetre.

What was the height of the sixth player?

(A) 1.85 m

(B) 1.86 m

(C) 1.91 m

(D) 1.93 m

18 Which of the following correctly expresses a as the subject of $s = ut + \frac{1}{2}at^2$?

(A) $a = \dfrac{2(s - ut)}{t^2}$

(B) $a = \dfrac{2s - ut}{t^2}$

(C) $a = \dfrac{\frac{1}{2}(s - ut)}{t^2}$

(D) $a = \dfrac{\frac{1}{2}s - ut}{t^2}$

19 Simon is a mechanic who receives a normal rate of pay of $22.35 per hour for a 40-hour week.

When he is needed for emergency call-outs he is paid a special allowance of $150 for that week. Additionally, every time he is called out to an emergency he is paid for a minimum of 4 hours at double time.

In the week beginning 2 February, 2011 Simon worked 40 hours normal time and was needed for emergency call-outs. His emergency call-out log book for the week is shown.

Employee: Simon Week: 2/2/11 to 8/2/11	
Date	*Duration of call-out*
3/2/11	5 hours
5/2/11	1.5 hours

What was Simon's total pay for that week?

(A) $1189.28

(B) $1296.30

(C) $1334.55

(D) $1446.30

Normal = 22.35 × 40 = 894

1st call out = 5 × 22.35 × 2 = 223.50

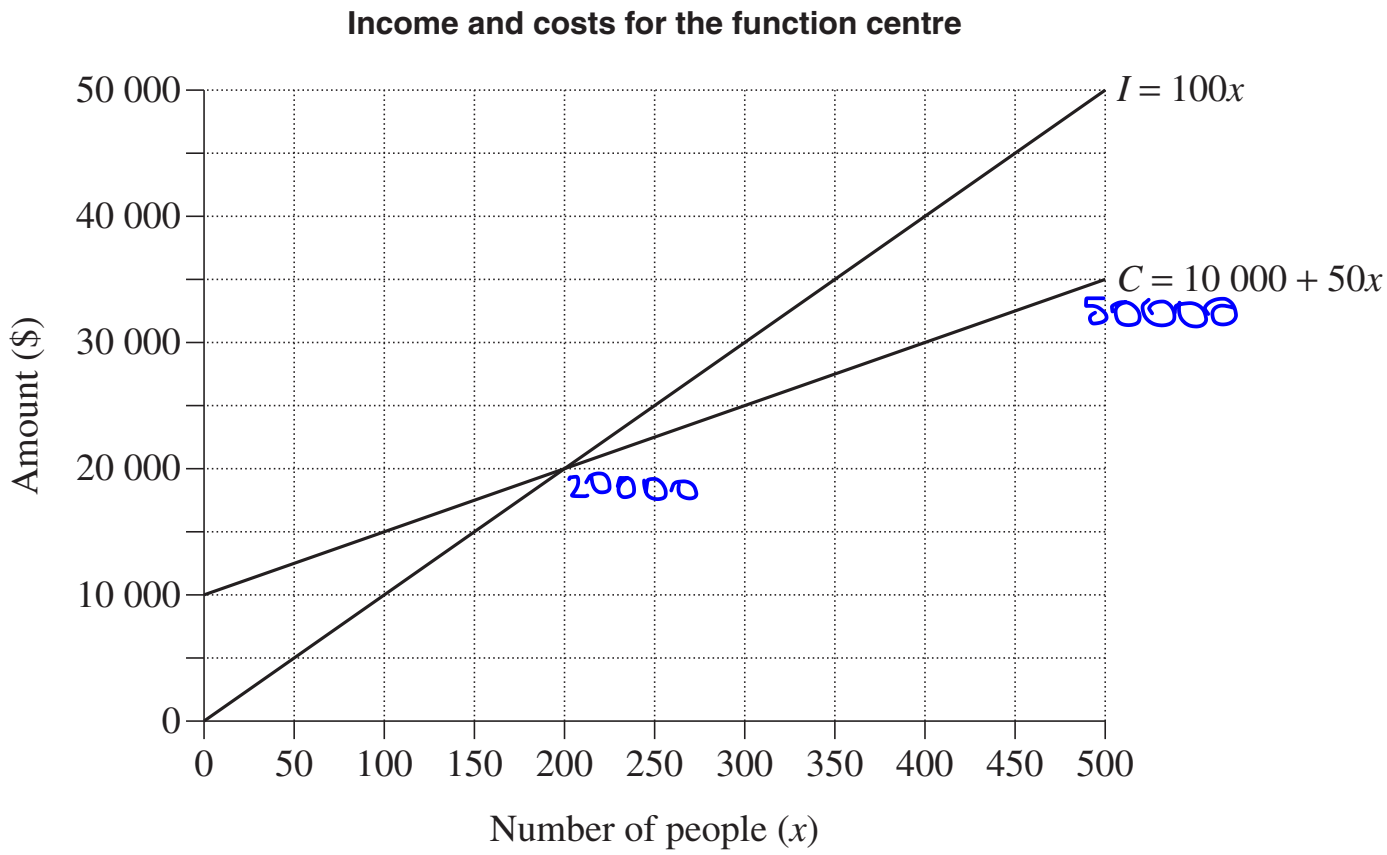
2nd call out = 4 × 22.35 × 2
= $178.80

20 A function centre hosts events for up to 500 people. The cost C, in dollars, for the centre to host an event, where x people attend, is given by:

$$C = 10\,000 + 50x$$

The centre charges \$100 per person. Its income I, in dollars, is given by:

$$I = 100x$$



How much greater is the income of the function centre when 500 people attend an event, than its income at the breakeven point?

(A) \$15 000

(B) \$20 000

(C) \$30 000

(D) \$40 000

21 A train departs from Town *A* at 3.00 pm to travel to Town *B*. Its average speed for the journey is 90 km/h, and it arrives at 5.00 pm. A second train departs from Town *A* at 3.10 pm and arrives at Town *B* at 4.30 pm.

What is the average speed of the second train?

(A) 135 km/h

(B) 150 km/h

(C) 216 km/h

(D) 240 km/h

22 Ying borrowed $250 000 to buy a house. The interest rate and monthly repayment for her loan are shown in the spreadsheet.

	A	B	C	D	E
1	**Home Loan Table**			*This table assumes the same number of days in each month, ie*	
2		Amount = $250 000			
3		Annual Interest Rate = 7.65%		Interest = Rate/12 × Principal	
4		Monthly Repayment (***R***) = $1871.94			
5					
6	**Month**	**Principal (*P*)**	**Interest (*I*)**	***P* + *I***	***P* + *I* − *R***
7	1	$250 000.00	$1593.75	$251 593.75	$249 721.81
8	2	$249 721.81	$1591.98	$251 313.79	$249 441.85
9	3	$249 441.85	$1590.19	$251 032.04	
10	4				

Sheet 1 | Sheet 2

What is the total interest charged for the first four months of this loan?

(A) $6364.32

(B) $6366.11

(C) $6369.67

(D) $6376.25

Month 3 : 251032.04 − 1871.94 = 249160.10

Month 4 : $249160.10 \times \frac{0.0765}{12} \times 1$

$= \$1588.40$